



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/771,092	01/26/2001	William D. Fisher	10003512-1	7692

7590 10/22/2003

AGILENT TECHNOLOGIES
Legal Department, 51U-PD
Intellectual Property Administration
P.O. Box 58043
Santa Clara, CA 95052-8043

EXAMINER

GORDON, BRIAN R

ART UNIT	PAPER NUMBER
----------	--------------

1743

DATE MAILED: 10/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/771,092

Applicant(s)

FISHER, WILLIAM D.

Examin r

Brian R. Gordon

Art Unit

1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 27-42 is/are pending in the application.
- 4a) Of the above claim(s) 27-34 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 35-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 7-3-03 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Newly submitted claims 27-34 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claims 27 and 31 do not require a device that comprises a chamber and a thermoelectric or piezoelectric ejector in the chamber. The method of claims 27 and 31 may be practiced by another materially different apparatus.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 27-34 withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Response to Arguments

2. Applicant's arguments, Paper No. 6, filed July 28, 2003, with respect to the rejection(s) of claim(s) 1-4, 10, and 11-12 under Kutami et al. have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Kutami et al.

Drawings

3. The drawings were received on July 7, 2003. These drawings are approved.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 1743

5. Claims 35-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. The term "improves pulse jet firing reliability" in claims 35-36 is a relative term which renders the claim indefinite. The term "improves" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. As to improving the jet firing reliability, the claim is not directed to any quantification standard for which one to compare the reliability of the device. It would be relative to ones personal view if the striking improves reliability. Since no standard is given for one to determine if the reliability improves, the claims are hereby rejected.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
9. Claims 1-12, 27-30, and 35-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kutami et al. US 6,132,035.

Kutami et al. disclose a method of employing an ink jet printing head includes a pressure chamber (rigid chamber) supplied with ink, a vibration plate, a nozzle, a force applying mechanism and a resilient member. The vibration plate is coupled to the pressure chamber and is subject to being driven in vibration to increase pressure in the pressure chamber when force is applied to the vibration plate. The nozzle communicates with the pressure chamber, and ink is ejected through the nozzle when pressure in the pressure chamber is increased. The force applying mechanism applies force to the vibration plate to drive the vibration plate in vibration and thereby increase the pressure in the pressure chamber to eject ink from the nozzle.

A wire magnetic type drive of the normal wire dot printing head, a stacked type **piezoelectric** element, or a **piezoelectric** element having a displacement enlarging mechanism may be used as the driving part.

As shown in FIGS. 3A through 3E, there is a system of using a thermal resistor element 7 which is positioned in the vicinity of a nozzle 6 as the pressure generating means. In the printing head employing this system, a pulse voltage is applied to the thermal resistor element 7 (thermoelectric ejector in the interior of the chamber), and bubbles 8 are generated within the ink by the heat which is generated, so as to eject ink particles 9 from the nozzle by this pressure. FIG. 3A shows an initial state of the bubble generation, FIG. 3B shows a state where bubbles are generated to a certain extent,

FIG. 3C shows a state where the bubble has grown large and the ejection of the ink is about to start, FIG. 3D shows a state where the ink ejection has progressed further, and FIG. 3E shows a state where the ink particles 9 have been injected.

According to the sixth embodiment and its modification, it is possible to sufficiently displace the outer wall 11a even when the pressure of the driving part 15 is small. Hence, the voltage applied to the driving part 15 can be small. Therefore, the power consumption can be reduced, and the reliability is ensured even when the size of the printing head is reduced. Moreover, the running cost is reduced.

According to the structure in which a shock is applied to the outer wall (vibration plate) 11a by the projection of the displacement transmitting part (wire) 14 (striker) so as to eject the particles 17a of the ink 17 from the nozzle 13 (opening of chamber), a tip end 14a of the wire 14 may fluctuate as indicated by a dotted line in FIG. 23 when it hits (strikes) the vibration plate 11a. In this case, the shock applied to the vibration plate 11a may weaken it, and shock may be applied to the vibration plate 11a two times. For this reason, the quantity, i.e., volume, and velocity of each of the ejected particles 17a of the ink 17 may decrease, and there is a possibility that the printing quality will deteriorate due to the double ejection.

In FIG. 25, the ink cassette 21 is made up of the ink tank 43, which stores the ink 17, and the plurality of pressure chambers 25 (25-1 through 25-N) which supply the ink 17 from the ink tank 43. This ink cassette 21 is fixed on a carriage 71 by a support 73.

In addition, the pressure applying mechanism 20 which is provided with a driving part 31 for driving and selectively projecting the plurality of wires 23 (23-1 through 23-N) is also fixed on the carriage 71.

The nozzles 24 (24-1 through 24-N) are formed in the respective pressure chambers 25, and the particles 17a of the ink are ejected in a direction shown by arrow B from a predetermined nozzle 24 by projecting the wire 23 to push the corresponding pressure chamber 24. A predetermined printing is made on a recording paper 72 by ejecting the particles 17a of the ink 17 in the direction shown by arrow B from the predetermined nozzle 24 and moving the pressure applying mechanism 20 and the ink cassette 21 by feeding the carriage 71. The nozzle 24 is provided on one end of the pressure chamber 25 and the vibration plate 25a is provided on the other end. Thus, the tip end part 23A of the wire 23 hits the vibration plate 25a when the wire projects in a direction shown by arrow A, and the particles 17a of the ink 17 are ejected in the direction shown by arrow B from the nozzle 24.

As to claims 5-8, Kutami et al. does not specifically recite a particular strike rate or the amount of energy delivered by each strike.

However, as to the strike rate and the amount of energy delivered to the chamber, Kutami et al. discloses that the pulse voltage V or the pulse width T of the driving signal S, which is supplied from a driving circuit 95 to the driving mechanism 20, is set to a predetermined value V1 or T1 by an instruction from a gradation instructing part 96. The driving mechanism 20 is driven by a predetermined driving signal S, so that

Art Unit: 1743

predetermined ink particles 17a are ejected from the nozzle part 21. The voltage may be varied as desired to supply the appropriate strike rate and pulse rate.

It would have been obvious to one of ordinary skill in the art at the time of the invention to recognize that the strike rate and work of the striker (wire) may be varied to perform at the limits given by the claims.

While Kutami et al. discloses an improved device that comprises a piezoelectric element separated from the chamber to prevent from discarding the element, it would have been obvious at the time of the invention to modify the method of employment the conventional device (that incorporated the piezoelectric element). If one was not concerned with discarding of the piezoelectric element it would have been obvious at the time of the invention to modify the method of using the conventional device by striking the device to expel ink from the chamber as further taught by Kutami.

10. Claims 13-14 and 41-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kutami et al. as applied to claims 1-4, 11-12, 27-30, and 35-40 above, and further in view of Wiktor US 9,232,129.

Kutami et al. does not disclose that the device comprises the device is employed for arraying DNA.

Wiktor discloses a piezoelectric actuated device for acquiring and dispensing fluid samples. Further more Wiktor recites that Hayes U.S. Pat. No. 5,622,897 describes a process of manufacturing a drop-on-demand ink-jet print head having n-type and p-type thermoelectric carriers.

Furthermore Wiktor discloses that instruments using pins for fluid transfer are used by Synteni, among other companies, to generate DNA arrays and are commercially available, for example, from BioRobotics and GeneMachines. Using pins is a simple, robust and practical means for fluid transfer but it suffers from some limitations. First of all it is slow. The pins have to stop at each spot and then wait for over a second for capillary action to transfer the fluid onto the substrate. By contrast, the piezoelectric based dispensing of the present invention is almost a thousand times faster. Pin based fluid transfer is sensitive to the wetting properties of the substrate. Also it can damage some substrates like Nylon membranes for example. These are not concerns for the piezoelectric dispensing which is non-contact. Pins generate relatively low density, poor quality arrays with approximately 50% variability in spot size. By contrast, piezoelectric dispensers generate arrays with almost an order of magnitude higher density and better than 3% spot size variability. Finally, pins are limited to acquiring and dispensing a fixed volume of fluid. Piezoelectric dispensers have thousands of times higher dynamic range. Sub nanoliter to tens of microliter volumes can be aspirated and subsequently dispensed in volumes ranging from 100 picoliters to several microliters per second.

It would have been obvious to one of ordinary skill in the art to recognize that the device of Kutami et al. may be employed to eject samples for a device comprising a thermoelectric or piezoelectric ejector overcomes the disadvantages using a pin assembly for arraying DNA samples.

Conclusion

Art Unit: 1743

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Shchegrova et al., Sasaki, Bass, Sugahara, Asai et al., and Raschke disclose fluid and ink dispensing methods and devices.

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian R. Gordon whose telephone number is (703) 305-0399. The examiner can normally be reached on M-F, with 2nd and 4th F off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 703-308-4037. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Art Unit: 1743

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

brg
October 8, 2003


Jill Warden
Supervisory Patent Examiner
Technology Center 1700